

# ABSTRACTS

## Presentations at the BACDA Study Day

### ***Breaking the News - Ann Leonard***

The report, ***Right From the Start***, (Scope 1994) highlighted the distress parents undergo as a result of the way they learn that their child is disabled. A national working group (of parents, disabled people and representatives of the major relevant professional and voluntary organisations) set out to understand the problem and come up with solutions. The group has produced a Template to support the development of good practice. This is now part of an expanding resource pack to support a training strategy in which parents and disabled people are centrally involved. The pack includes an interactive CD-ROM. The ***Right From the Start*** initiative is being developed through a series of local projects linked through the national ***Right From the Start*** working group. Today's presentation will allow exploration of the issues and principles that underpin the ***Right From the Start*** initiative.

### ***Critical Review of the Role of Hearing Screening in the identification of Permanent Childhood Hearing Impairment. - John Bamford***

Following the NDCS Quality Standards published in 1994, the Health Technology arm of the NHS R&D Executive commissioned a critical review of the role of neonatal screening in the identification of permanent childhood hearing impairment.

The review was carried out between April 1995 and September 1996 by Adrian Davis (MRC Institute of Hearing Research) and John Bamford (CAEDSP University of Manchester). Published literature in the areas of epidemiology, outcomes, performance of screening tests was critically reviewed. A survey of current practice was carried out and colleagues from Sheffield (Stevens, Hall et al) carried out a study of cost of screens. This presentation summarises some of the main findings from the review and the consequent recommendations.

### ***Neonatal Hearing Screening - the Implications. Peter Watkin***

Neonatal Hearing Screening of all babies within the maternity unit is now feasible using Transient Evoked Otoacoustic Emissions (TEOAE) recording. However, in many maternity units in the UK a majority of babies are discharged within the first 45 hours.

During the first two days of life, there is a higher proportion of babies in whom emissions cannot be recorded. A universal TEOAE screen has been implemented in Whipps Cross Hospital. Because 70% of the babies are discharged from the maternity unit before they are 48 hours old, a two-stage screen was implemented, with failure at the initial TEOAE test being followed by a retest after 4 - 6 weeks.

The maternal anxiety caused by this model was investigated in 288 mothers enrolled for the initial TEOAE test. Generally anxiety was low and attitudes to health were positive. 97% of mothers considered the screen to be worthwhile at the initial test with 1.5% feeling it had caused some anxiety but less than 1% being very worried.

The mothers who had some anxieties were not dissatisfied with the screen, and within this group there was no increase in the proportion of babies who failed the initial test.

At the retest, 2 of the 57 mothers (3.5%) considered that they were very worried, but there was no significant deterioration in attitude towards the screen. Spielberger's State-Trait Anxiety inventory revealed no significant difference in the anxiety state of the retest group when compared with a control group whose babies had not received a neonatal hearing test. The results of the initial test and the retest did not influence the anxiety state of the mothers.

Ways of minimising anxiety caused to a minority of mothers while maintaining positive attitudes to the screen are discussed.

## *Universal Neonatal Screening - Why & How.*

**Lindsay KIMM, Research Fellow, Dept. of Child Health, University of Southampton.**

### **Southampton Audit:**

An audit was carried out of all hearing impaired infants born in the Southampton and South West Hampshire district between the 1st January 1980 and the 31st December 1989. The study commenced in 1991 and was completed in 1995 when the youngest child was 5 years of age.

**A total of 88 infants were identified with a congenital hearing impairment of 240dBnHL in the better ear.** This figure represents 1.7 per 1,000 live births. Overall over half of these infants had no known associated risk factor when the hearing impairment (H.I.) was identified. The result of the 8 months distraction test was known in 64% and of these 51% passed the Health Visitor screen. The median age of identification was 21 months. 31% remained unidentified until they were over 3 years of age.

**Previous work:** A pilot study carried out in Southampton identified a screening protocol which was non-invasive, quick and had a specificity, for H.I.  $>40\text{dBnHL}$  in the better ear, of over 99%. A subsequent feasibility study was carried out to determine what staff and equipment would be required to effectively implement this protocol for all newborns, before their discharge from hospital.

### **The Wessex Neonatal Hearing Project**

**(W.N.H.P.):** The main aim of the W.N.H.P. is to answer the research question:

**How effective is neonatal screening for the early detection of H.I.?**

**Design:** This three-year controlled trial of universal neonatal screening for H.I. commenced in October 1993 with four participating maternity hospitals. (The Princess Anne Hospital,

Southampton, St. Mary's Hospital., Portsmouth, The Royal United Hospital., Bath and The Princess Margaret Hospital., Swindon). 42,000 babies were born and all were offered the 8-month distraction test and given the W.N.H.P. checklist on H.I. This checklist includes information on whom to contact and where to go if there are any concerns about hearing. 21,000, have been screened neonatally for H.I. Eight research nurses, with no previous audiological experience, were recruited and given three weeks training; one week theory and two weeks practical.

**Test Protocol:** Babies were initially tested using the IL088 OAE equipment. This test was carried out at the bedside on the normal post-natal wards. If no OAE's were recorded the babies were then tested using automatic ABR, the Algo-1 Plus. This test was carried out in a separate room. **The consent of a parent was required before any testing could be carried out.**

**Outcome:** A total of **21,190 babies** were screened neonatally for H.I. A mean coverage of 87% was achieved, rising to 95% in one site, when a 'recall' system was introduced. Age at test greatly influenced OAE test outcome. In babies  $<48$  hours OAE's could not be recorded from 11% of ears; in babies  $>48$  hours OAE's were successfully recorded from 96% of ears. 75% of the babies screened were  $<48$  hours of age at time of test. Overall referral rate from the screen was 1.6%. Yields of H.I. infants per 1000 live births:

	<b>NON-TESTING PERIODS</b>	<b>TESTING PERIODS</b>
Overall:	<b>0.7</b> (0.4 - 1.0)	<b>1.2</b> (1.0-1.6)
Yield before 9m.	<b>0.3</b> (0.1 - 0.5)	<b>1.1</b> (0.6 -1.5)
Yield of HVDT	<b>0.1</b> (0 - 0.3)	<b>0</b>

***The Sheffield Targeted Neonatal Hearing Study.***  
***Neonatal TEOAE, ABR and 8 month testing as predictors of hearing impairment at age 5 years***  
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Fourteen hundred and thirty babies considered to be 'at risk' of hearing impairment were entered into a study between 1985 and 1992 to evaluate the use of transient evoked otoacoustic emissions (TEOAE) and the auditory brainstem (ABR) response as methods of detecting hearing impairment in the new-born. All babies entering the study were recalled for a hearing assessment at 8 months corrected age and again at three and one half years of age. The final outcome for each child was defined as the outcome of the three and half year screen with follow up of screen failures to age five.

Result of the outcome at the neonatal stage and 8 month stage have been reported previously. (Stevens et al. 1987, 1990, 1991 & 1993). The results from the final stage of the study are now complete and this paper will present an analysis of the neonatal and 8 months screen with respect to the results of the final hearing assessment.

Comparisons of results at the neonatal stage and 8 month stage with the final outcome at the age of 5 years showed the presence of both false positive and false negative results from each screen with a poor relationship between hearing thresholds measured at each stage.

Of those children with a permanent hearing loss of over 70dBHL at 5 years 56% failed the neonatal TEOAE test and 69% the ABR test. For those with a hearing loss over

50dBHL the figures were 44% and 52% respectively. It is concluded that until further knowledge is available babies that fall within an 'at risk' group should be tested by ABR. The 8 month screen found only a slightly greater proportion of those with a permanent hearing loss at 5 years of age compared to the neonatal ABR screen, giving an incremental yield of 12% and 15% for hearing losses over 70dBHL and 50dBHL respectively.

Overall the figures found from the study for detection of permanent hearing loss up to the age of 5 years for the TEOAE and ABR neonatal screens were lower than that found by previous retrospective studies and a recent ascertainment study by Lutman et al. (1996). The results indicate that with the introduction of neonatal screening there will still be a need for methods of detecting late onset hearing losses, although the low incremental yield of the 8 month behavioural screen suggests that this is not the solution.

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***The Costs of Early Hearing Screening in England & Wales***  
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A survey was carried out to determine the costs of hearing screening as practised in England and Wales in the first year of life. Those screens investigated were targeted neonatal (TN), universal neonatal (UN) and the health visitor distraction test or alternative surveillance (HVDT).

Ten districts participated in the study, being selected on the basis that they had fully established screening services and were able to provide statistical and cost data on their service performance. Valid data was available from 5 districts for TN, 3 for UN and 9 for HVDT, although only 5 of the latter had valid data for follow up costs. Calculations were based on staff time for those directly involved in the service and forty percent was added to these costs to allow for overheads. The cost of the follow up work resulting from each screen was included. The figures are based at 1/4/94.

The neonatal costs were consistent across the districts surveyed whilst those for the HVDT screen varied considerably.

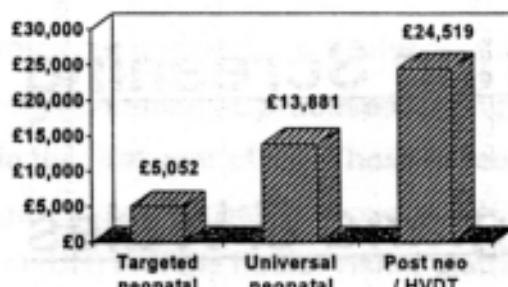
The mean service costs for TN, UN and HVDT were £5,052, £13,881 and £24,519 for a standardised district of 1000 live births.

Despite the limitations of the study, three conclusions already seem justified. Firstly, UN screening need not be prohibitively expensive. Its cost, from this survey, was considerably lower than that of the HVDT. Secondly, TN screening appears to be relatively inexpensive compared to universal screens, although it will only detect a proportion of the congenitally hearing impaired.

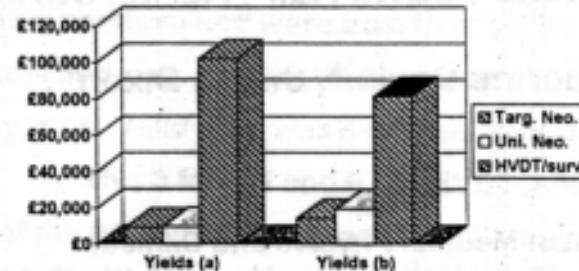
Thirdly, calculations of the cost per case identified, using available data on the yield for each type of screen, indicate that whilst universal neonatal screening is more expensive than targeted neonatal screening, both types of neonatal screen are considerably less expensive per case identified than the Health Visitor Distraction Test.

**Note.** This is a summary of the study, which will be published in full in the Archives of Diseases in Childhood.

***Comparison of mean service costs per 'standardised district' of 1000 births***



***Cost per case detected***



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***A Critical Review  
of the Role of Neonatal Hearing Screening  
in the Detection of Congenital Hearing Impairment***

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### **Background**

This review aimed to enable a set of recommendations for policy and practice to be made that help (1) to reduce the current confusion and variations in practice surrounding screening for permanent childhood hearing impairment; (2) to provide access to data which can inform better practice for purchasers and providers of health care, and thereby help to deliver more uniform earlier detection, better outcomes and improved cost-effectiveness of screening; and (3) to identify specific areas for further research and service development.

The UK has an unrivalled history of service development in children's hearing screening. Over 50 years ago the 1944 Education Act gave local authorities the means to implement pre-school as well as school-entry hearing screening as it was strongly argued that identification of permanent congenital hearing loss by school entry was far too late. The pre-school screen was first developed in the 1950s. It was administered at about the age of 9 months by Health Visitors and became widespread in its application in the 1960s. This Health Visitor Distraction Test (HVDT) is currently implemented at 7-8 months of age, and consists of localisation responses to low level sounds presented to the child by a tester while the child's attention is suitably manipulated by a second tester. Universal pre-school and school screening are well established procedures in the UK that have received continued endorsement.

However, doubts have been expressed about the efficiency of the HVDT with up to 20-25% of hearing impaired children not benefiting from hearing aids before school age in the late 1980s/early 1990s. Furthermore tried and tested technology now exists to screen children earlier, in the first day or so after birth. This technology has been taken up piecemeal by providers in the UK over the last ten years and such ad hoc service creep has been given added impetus by the US National Institutes of Health consensus conference on early identification of hearing impairment which endorsed universal neonatal screening for the USA. Some UK providers have implemented targeted neonatal hearing screening and a few universal neonatal screening. There is considerable confusion about what is best practice and why; hence the need for this review.

### **Research Methods**

There were two major strands to the work. In the first, the literature was searched, both electronically and by hand, for references concerning the epidemiology of permanent childhood hearing impairment (PCHI), the outcome evidence regarding early/late intervention for PCHI and the evidence concerning the performance of hearing screens. In the second, a comprehensive survey of current pre-school hearing screening practice was undertaken, a health economic study of hearing screening costs was carried out<sup>1</sup>, focus groups of professionals involved in screening and parents were held and finally visits were carried out to a number of key sites to help validate the evidence gained from the literature and surveys.

### **Research findings**

The evidence presented in the review falls in five major categories concerning the epidemiology of PCHI, outcomes, current practice, cost, and screen performance. The evidence is summarised and conclusions drawn so that the options available for identification of PCHI can be compared in terms of running cost, incremental yield, efficiency (the ability to provide patients with treatment and care which is both clinically effective and good use of resources), responsiveness (the ability to meet the needs of individual patients) and equity (the ability to improve the health of the population as a whole and reduce variations in health status).

### **Evidence from Epidemiology (from Chapter 2)**

- 1) There are about 112 per 100,000 children who have a congenital Permanent Childhood Hearing impairment (PCHI) of  $\geq 40$  dB HL in the better ear. The expected annual number of children with congenital PCHI in the UK is 840 at a bilateral hearing impairment level of  $\geq 40$  dB HL, or 675 at a level of  $\geq 50$  dB HL of whom 173 might have a severe impairment and 180 a profound impairment.
- 2) At a district level the annual incidence of children with

<sup>1</sup>We are very grateful to the members of our key advisors group for their help, and in particular Dr John Stevens and Professor David Hall who coordinated the health economic evaluation.

PCHI is small (<7 on average) and highly variable from year to year as expected from statistical fluctuations in small numbers.

- 3) About 16% of PCHI may be acquired, progressive or of 'late onset', one third of which is caused by meningitis (after which a hearing **assessment** is essential). Thus about 10% of PCHI may be currently considered as either progressive or 'late-onset'. These 10% would not be detected by a screen at birth, and the majority of them not at 6 - 8 months.
- 4) Major indicators of service performance e.g. ages at referral, identification, fitting of hearing aids vary substantially with severity of impairment. Overall they fall far short of the NDCS 1994 targets, with a median age of confirmation of hearing impairment of 17 months, and a quarter of children not being identified until 42 months of age. The present system does not identify half of the congenitally impaired children by eighteen months, by which time only one in three of these children has hearing aids. By the age of two, when spoken language is developing apace, we estimate only 46% have access to hearing aids, largely due to late identification.

#### ***Outcome Evidence (Chapter 3)***

- 1) Theoretical arguments on auditory and cognitive plasticity are that earlier stimulation is much better for developing the individual child's auditory and cognitive potential. Furthermore, there is an argument and some evidence that neural change occurs as a consequence of diminished sensory input.
- 2) There is some evidence of reasonable quality that earlier identification is associated with improved outcomes in the communication domain, although this evidence remains restricted in scope and magnitude of effect. The extent and precise nature of the benefits are not yet fully explored. Outcome benefits in other domains (e.g. educational achievement, mental health) remain to be explored.
- 3) There is substantial belief among professionals and parents that earlier identification is better for the family as a whole and enables a very much greater responsiveness to the needs of the child and family.
- 4) There is evidence that neonatal hearing screening, properly implemented, does not cause undue anxiety for parents.

#### ***Evidence from the survey of Current Practice (Chapter 4)***

The survey of current practice showed that services lacked adequate accessible information, and that there was no systematic information coordinated between the agencies that share responsibility for the continuing care of individual hearing impaired children.

#### ***Neonatal screens***

- 1) Two universal neonatal screening programmes in the UK are running as successful services and were able to provide figures for the present survey with no difficulty. The Wessex trial of neonatal hearing screening also supplied valuable data on a systematic comparative trial of neonatal screening and the HVDT.
- 2) Just under two thirds of all districts have a neonatal hearing screening or assessment programme **of some sort**. These are mainly targeted at high risk children with a history of NICU/SCBU or a family history of hearing impairment.
- 3) In those programmes that target the NICU/SCBU children, less than 1 in 3 of all children in NICU or children with family history of childhood deafness are tested. Coverage is focused on those at very high risk, due to lack of funds for extending the testing.
- 4) The failure rate for the predominantly at-risk group at first test is of the order of 10-12%, with overall referral rates of about 5-8%.
- 5) The reported yield from neonatal screening is already quite high, with 100 babies being detected with PCHI of  $\geq 50$  dB HL in 1994. This represents about 35% of the babies who might be expected to have a congenital hearing impairment of this level in the districts using such tests, and about 16% of all such children in the UK.
- 6) The overall field sensitivity of neonatal screening programmes seems to be of the order of 85%, in the at-risk populations reported in the survey of current practice.
- 7) The age at hearing aid fitting for those screened neonatally is routinely well within six months of age, at least for severe and profound cases.

#### ***The Health Visitor Distraction Test (HVDT)***

- 1) The HVDT is used as a universal hearing screen in about 98% of all health districts.
- 2) The professionals responsible for carrying out the HVDT come from a more homogenous group than for neonatal screening. However, whereas for targeted neonatal screening there might be only one person testing within a whole district, there could be more than 60 full-and part-time staff who might perform the HVDT in a district of average size.
- 3) The average reported coverage of the HVDT is about 90%.
- 4) The average reported referral rates for HVDT is nearly 10%.

- 5) The reported yield from the HVDT is lower than expected and is 26-28% of the expected number of congenitally hearing impaired children for the fifty or so providers (one in three) who gave data.
- 6) In a small number (14) of districts data for both targeted neonatal and HVDT screens were available. There was no suggestion here that the neonatal screen depressed the yield from the HVDT. This was most likely because the yield from the HVDT was low in these districts, rather than that it was picking up late onset or progressive impairments. The HVDT yield for the fourteen districts was very close to the yield of 25-28% of the 50 providers who gave us data.
- 7) The average age at hearing aid fitting following the HVDT was 18 months, which is similar to that reported elsewhere.

#### ***Evidence from Costs (Chapter 5)***

- 1) The cost comparisons within the different implementations of hearing screening in the first year of life are encouragingly uniform, with systematic differences being observed between implementations such that universal neonatal screening appears to have lower initial cost associated with it than the HVDT on a cost per child screened basis. The cost per case found would be several orders of magnitude lower with universal neonatal screening.
- 2) In terms of running costs (excluding start-up and equipment costs, but including employers full cost plus 40% overheads) in the nine districts surveyed the HVDT screening is costing about £24.5k per 1000 live births, including follow-up of false positives. This is reduced to about £20.6k when structured surveillance is used instead of the distraction test.
- 3) The mean standardised cost of universal neonatal screening is about £13.9K per 1000 live births, in the three districts who were conducting such screening in England, including follow-up costs. These data compare well with the costs in the USA of fully funded services, rather than those who use unpaid volunteers.
- 4) Targeted neonatal screening is costing a mean of about £5.1k per 1000 live births, testing between 6-10% of all live births. However, an incremental yield in excess of 40% of congenital PCHI cases has not been consistently demonstrated. In the service format that is commonly used in the UK, i.e. targeted neonatal screening and universal HVDT, cost per case detected by the HVDT is very high, in some districts approaching £125k per child detected.
- 5) If universal neonatal screening (UNS) were to be introduced, there would need to be transitional funding for a period of at least 6-8 months when the two screens would have to run in parallel because young children just discharged from hospital would not be screened at all if the HVDT was abolished on the day universal

neonatal screens were introduced.

#### ***Performance of Screens (Chapter 7)***

##### ***Neonatal***

- 1) High coverage (90%+) for universal screening is possible.
- 2) All neonatal screening methods show high screen specificity, generally well above 90% after a “settling in” period.
- 3) Evidence on test sensitivity for moderate and greater cases of congenital PCHI is less available, but estimates range from 80 to 100%. Generally, programme sensitivity (including cases which were not covered, and/or which are late onset or progressive) may be estimated to be nearer 80%.
- 4) The two large cohort studies of universal neonatal hearing screening in the UK, including the controlled trial in Wessex, produce yields of the expected order, i.e. 1 - 1.3 per 1000, and decrease the subsequent incremental yields of the HVDT to very low levels.
- 5) At-risk neonatal screening has a potential yield of about 60% of all cases. In practice, however, this is likely to be much lower because of the difficulty of implementing full coverage for all indicators of at-risk cases; perhaps 45-50% at best.
- 6) The median identification age of those screened neonatally is of the order of two months, depending upon follow up procedures and severity of impairment, and is earlier than for cases not screened neonatally.

##### ***HVDT***

- 1) Coverage of the HVDT screen probably falls in the range from 80 - 95%, although there may be some urban areas where coverage falls to nearer 60%. There is some limited evidence suggesting that coverage and sensitivity is lower in the Asian population.
- 2) Sensitivity estimates of the HVDT vary widely, from 18% to 88% (all degrees of loss). Recent and more powerful studies are suggestive of poorer levels of sensitivity. Severity of impairment affects screen sensitivity substantially.
- 3) Screen-positive, i.e. “Fail” rate is of the order of 5-10 %.
- 4) HVDT incremental yield may be at very best 40% but it falls off for these best districts to low levels (e.g. 25%) when at-risk neonatal screening is introduced. With universal neonatal screening, the evidence indicates that HVDT incremental yield falls to very low levels.
- 5) Median age of identification via the HVDT varies from 12-20 months.

## ***Conclusions from evidence***

There are approximately 840 children a year born in the UK with significant permanent hearing impairment, likely to affect their (and their family's) quality of life substantially. Present services will NOT identify about 400 of these children by one and a half years of age, nor about 200 of these children by three and half years of age. Such late identification of hearing impairment greatly reduces the responsiveness of the services for individual children by significantly decreasing the flexibility in managing the habilitation of the child and family. Hearing impaired children identified 'late' will in addition be substantially delayed in their acquisition of language and communication with the consequent longer term risk to educational achievement, mental health and quality of life.

The universal HVDT has been used as the main screening programme to detect these children, and is achieving a yield of less than 30% at an estimated cost of between £60-84k per child detected. The programme is being managed by individual providers, in their own way, and there are no recognised national quality standards. It is very difficult to monitor the programme at district level because of the small numbers of true positives, and the long wait to confirm missed children. The HVDT is not an efficient or cost-effective service. Furthermore there are some data that suggest that the HVDT is an inequitable service as its coverage is low for 'non-white' and 'struggling' households

In order to reduce median age of identification, targeted neonatal screening has been introduced in many districts since 1994 in an ad hoc fashion, in many places without funding for full coverage of the major at-risk groups. However, this potentially further weakens the effectiveness (and cost-effectiveness) of the HVDT. Furthermore, whilst its effect on the median of the distribution of age of identification may be substantial, its effect on the tail of the distribution may be slight unless the quality of the HVDT is greatly improved. The yield of targeted neonatal screening, as presently implemented, is somewhat low (about 35% rather than 50-60%) due to low coverage of at risk groups, but its sensitivity for moderate or worse PCHI has been assessed as between 80-90%.

Neonatal screening, in the UK, has been successfully implemented for targeted and universal screening. In the USA there is now a considerable number of successfully operating universal neonatal hearing screening programmes, but as yet very little data from systematic prospective trials. In the UK, the one research programme with a systematic prospective comparative study of universal neonatal screening and the HVDT has shown a substantial advantage for neonatal screening, with greater yield and the ages of identification and aiding much younger. These results, concerning yield, are corroborated by two further centres that use universal neonatal screening routinely. Furthermore, universal neonatal screening has a lower running cost than the HVDT, and a considerably lower cost per child detected.

Universal neonatal screens in the UK have shown that coverage can be in excess of 90%, and its specificity about 95%. It is too early to assess sensitivity yet, but judging by the yields, it should exceed that of the targeted neonatal screens and may be higher than 90%.

## ***Option appraisal***

Options in four different categories are shown in the Table and were evaluated in terms of their running cost, incremental yield, efficiency, responsiveness and equity. The recommendations are based on this analysis.

**The first option (O)** was NOT to screen. This was rejected because of the number of children affected and the large impact congenital hearing impairment has on children and their families.

**The second set of options (H)** were configured around the universal HVDT as the major screen, with some options including targeted neonatal screening, and one option a potentially better (but yet to be developed and tested) hearing test to be used by the health visitors. These options did not have a high estimated yield, but did have a very low efficiency due to the very high cost per child detected. Using the HVDT, as presently implemented, over 50% of hearing impaired children would not have access to a hearing aid by age 2 years and 40% not by age 3 years. Such children would have a high probability of being substantially handicapped by such late detection. These options are therefore low in responsiveness to these children's needs and low in terms of equity.

**The third set of options (T)** were configured around targeted neonatal screening. These options are low in terms of marginal cost and are highly efficient. However, even if combined with a targeted HVDT such options score lowly in terms of equity and responsiveness.

**The fourth set of options (U)** were configured around universal neonatal hearing screening. Such options are more efficient than H, have a lower marginal cost and greater equity. They enable a greater responsiveness, not necessarily because the age of identification will be very early but because the children who would not have been identified by the HVDT or other procedures in the first two years of life will have a better and more uniform chance of early identification and habilitation. Option U2 has, in addition to universal neonatal hearing screening, a targeted infant distraction test that is primarily for those who did not have a neonatal screen.

**A table giving different possible options, their costs, benefits and challenges.**

It is assumed (i) that there will be Health Visitor Surveillance for all children age 0-5 years (as per Health For All Children, cost unknown) and (ii) that the School Entry Screen will be retained for all options (at a cost of about £2-4k per 1000 live births). All costs standardised to per 1000 live births (not 1000 children tested). The cost per case identified is a broad estimate based on the programme cost and yield

Screening Option	Marginal costs associated / 1000	Incremental Yield	Efficiency	Responsiveness	Equity	Benefits	Challenges
<b>O</b> No first year screening (responsive service only)	None	Yield estimate uncertain - maybe < 0.2 per 1000 in first year (<20%)	Very Poor Cost per case indeterminate	Poor (with possible exception of profound PCHI)	Very Low	Releases time/money to invest in responsive system, improvement of habilitation facilities for severe/profound	Moderate and severe PCHI not identified until >2yrs, possible identification if language screen about 2yrs
<b>HO</b> Universal HVDT	£24.5k Total = £24.5k	Present average yield is 0.25 which might be increased to 0.4 with good quality control	Poor Cost per case £80 - £100k	Fair	Low	Would consolidate present services and remove uncertainty for HVs	Need better training, facilities & quality standards for HVDT ID age sub-optimal
<b>H1</b> Hall report recommendations Targeted neonatal screening: Introduce targeted screening where not already implemented and make more systematic where very limited at present Universal HVDT	£5.1k £24.5k Total = £29.6k	Yield estimates if both NICU and Family history groups can get high coverage and better HVDT quality control 0.5 per 1000 by six months, 0.75 per 1000 by 1year	Poor Cost per case about £40k (incremental cost per case for HVDT about £100k)	Fair	Medium	Little change to system, would help build up targeted screening	Need better training, facilities and quality standards for HVDT, for targeted screening and for very early habilitation in all districts Implementation of family history difficult Overall sensitivity of system poor. ID age sub-optimal
<b>H2</b> As for H1, but following R & D implemented technologically advanced HVDT, with increased levels of stimuli	As for H1, with HVDT reducing to about £20k Total = £25.1k	Yield as per H1, possibly increasing to 0.8 per 1000 by 1 year	Fair Cost per case about £31k (incremental cost per case for HVDT about £80k)	Fair	Medium	Limited change to system, and better test possible for HVDT if accepted	As H1, but sensitivity possibly better. New equipment needs to be developed, evaluated and bought
<b>H3</b> As for H1, but replace Universal HVDT with 6-8m Universal HV surveillance by questionnaire	As for H1, with HV costs reducing to £20.6k Total = £25.7k	Yield as per H1 or slightly less, Particularly the moderates	Poor Cost per case About £45k (incremental cost per cases for HVDT about £84k)	Fair	Medium	Limited change to system, well trialed already. More in-line with HV mission	As per H1

Screening Option	Marginal costs associated / 1000	Incremental Yield	Efficiency	Responsiveness	Equity	Benefits	Challenges
<b>T1</b> Targeted neonatal screening: Introduce targeted screening where not already implemented and make more systematic where limited at present	As for H1, but no HVDT  Total = £5.1k	Yield estimates given high coverage of both NICU and Family history children, 0.5 per 1000 by six months, but probably poor thereafter	Fair to good  Cost per case About £10k	Fair  Low	Better quality control possible	As per H1, tuning the responsive system to find the remaining 0.6 per 1000, possibly needing to spend more on HVs	
<b>T2</b> As for B, but replace the HVDT with targeted infant distraction test	As for H1, but HVDT possibly reducing to about £8k  Total = £13.1k	Yield likely to be more than T1 but less than H1	Good  Cost per case About £17k	Good  Medium	Better quality control possible, if less HVs involved, or specialist referral system	As per H1 plus Definition of HV target population, crucial to combat inverse care law, needs research to define	
<b>U1</b> Introduce universal neonatal screening	£14k  Total = £14k	Yield 0.9 per 1000 by six months	Very good  Cost per case About £15k	Good  Medium	Age ID very good Greater potential for habilitation and education to give benefit	What to do for those not tested and for late onset/progressive cases National support needed	Training, coordination and follow-up pose significant implementation challenges
<b>U2</b> Introduce universal neonatal screening  Modify infant distraction test to be targeted on those not tested and high risk of progressive PCHI	£14k  £3k  Total = £17k	Yield 0.9 per 1000 by six months and possibly 1.0 per 1000 by one year	Very good  Cost per case about £17k (incremental cost per case for IDT £30k, very approximate)	Very good  Medium	Age of ID best that can be achieved for all PCHI groups. Greater potential for habilitation and	National support needed	Training, coordination and follow-up pose significant implementation challenges including how to target progressive cases.

## Main recommendations

The recommendations that stem from the evidence have been made in the light of the ongoing service context. If a hearing screening programme were being set-up ab initio a further large scale randomised control trial might be required. However with neonatal hearing screening there is a very strong case for setting up the programme without further long term research. First, there is good trial evidence for universal neonatal hearing screening from the completed Wessex Trial (see Chapter 7 for a review of this evidence which is currently being prepared for publication by Kennedy and colleagues); second, there is an existing but inadequate screen in place and to withdraw it without replacement would be unacceptable; and third, the potential harm from treatment consequent on detecting cases is not a major factor in the case of screening for a hearing impairment.

The report makes a number of recommendations in three categories service development (1-4), implementation (5) and research (6), where the weight of the evidence strongly supports:

1. The introduction of a national screening programme for congenital hearing impairment based upon universal neonatal hearing screening. The option appraisal argues that districts should develop a screening programme that is based on Option U2, universal neonatal screening, and a targeted screen using an infant distraction test at about 7 months (primarily for those who have not had the neonatal screen). This option is the most equitable and responsive, provides the best value for money, and potentially gives the greatest benefit for hearing impaired children and their families.
2. The development of an information system strategy, at the local level, that will facilitate the coordination of the services needed for hearing impaired children, in line with NHS priorities 1996/7. The local 'shared-list' (or registers) of hearing impaired children that would be the backbone of this strategy will be essential in auditing any option chosen and in maintaining a quality screening service. A subset of the locally available information should form the basis of a regional or national list, that would play a key role in monitoring any national screening programme. This strategy should link into the local Child Health Record Information Systems where possible. We estimate the additional recurrent cost of such a strategy to be about £1k per 1000 live births.
3. A systematic appraisal of the role of Health Visitors in the identification of children with late-onset or progressive PCHI. Due consideration and priority should be paid to other aims included in the Health Visitor role, e.g. detecting the effects or signs of persistent OME. Individual districts will have to appraise the priority they give to the detection of persistent OME and the use of surgical intervention that flow from detection in the first years of life.
4. Access to specialist paediatric otological opinion for

children who are being assessed for PCHI. This will help reduce the chance of delays in initiating appropriate habilitation that have occurred in the past from ENT referral.

5. The adoption of a model screening programme, including appropriate targets, around which the preferred option might be based. Such a programme should have as its main aim the early identification of all children with a permanent hearing impairment of at least 40 dB HL (averaged in the mid frequencies on the better ear). It should be the responsibility of an individual (or committee) to implement (including negotiating appropriate transitional arrangements) and monitor the programme. The target should be set such that habilitation for all congenitally hearing impaired children should be initiated by at least 12 months of age and be provided within a service context that is perceived as seamless by parents and their children. Service links with education are likely to be crucial and need to be well coordinated. The relevant groups in the voluntary sector, whose involvement is guaranteed by law, have a significant support and coordinating role.
6. Consideration of four priority areas of research and development that flow directly from the review: (i) management of children identified by neonatal screening both diagnostic and rehabilitative (including 3 RCTs that should be considered as a high priority), (ii) models for coordination of services, including the possibility of developing a Joint Commissioning model, (iii) development of screening techniques both for the targeted infant distraction test and for 'early discharge' neonatal screening and (iv) epidemiology, in particular the prevalence and risk factors of late-onset and progressive cases, and the development of a national register of hearing impaired children alongside the shared lists that should be developed at a district level.

## Publications

Adrian Davis, John Bamford, Ian Wilson, Tina Ramkalawan, Mark Forshaw, Susan Wright: *A critical review of the role of neonatal screening in the detection of congenital hearing impairment*. *Health Technology Assessment 1997: 1(10)*.

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Bamford J, Davis A: *Hearing screening in TJ David (ed.) Recent Advances in Paediatrics vol. 17, 1998*

Stevens J, Hall D, Davis A, Davies CM, Dixon S: *The costs of early hearing screening in England and Wales. 1997. Archives of Diseases in Childhood (in press)*

## **Profound deafness following meningitis - implications for cochlear implantation**

**A.Dodds D.Sutton A.Forsyth**

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We present three children profoundly deafened following meningitis, referred for cochlear implantation and all having a degree of osteoneogenesis, which significantly affected the implantation. Although we have no answers to the problems identified. We hope that our paper sparks some thought, discussion and consideration of practice when presented with a child profoundly deafened following meningitis. We would also hope to 'spread the news' and enable audiologists in this situation to be more aware of the many issues to be considered.

These cases are presented as they appeared chronologically in the Specialist Paediatric Audiology clinics in the North West of England.

### **Case Study 1**

Case 1 was aged 2 years 7 months when she developed Streptococcus pneumoniae meningitis. She had neurological complications, which included a right ptosis, left lower motor facial palsy and pyramidal signs of the right arm and leg. She was referred to audiology on day 33 after admission and an appointment in the specialist audiology clinic was arranged for day 67 after admission. The audiological assessment indicated a profound hearing loss. However the reports from home suggested fluctuation in her response and the family felt she could hear and that her behavioural problems were due to the extent of the illness. ABR and repeat behavioural tests day 81 after admission confirmed a profound loss across speech frequency range.

The recommendation at this stage was to arrange home guidance with Teacher of the Deaf, urgent fitting of hearing aids and referral to Cochlear Implant Team. This was made eight weeks after discharge following meningitis and hearing aids were fitted 11 weeks after discharge. A CT scan was carried out 18 weeks after discharge and at the same time the family had their first visit to the to meet cochlear implant team. The CT scan reported "incipient ossification both cochleas; left cochlea completely obliterated" Following this urgent cochlear implant was advised and a date was given for 3 weeks later" Cochlear implantation, using a Nucleus 22 channel intracochlear device was carried out 26 weeks after the onset of meningitis. Widespread ossification of the scala tympani was encountered and only 8 out of the 22 electrodes were able to be inserted. The following month the 8 active channels were programmed and tuned to create a MAP.

### **Case Study 2**

Case 2 was aged 10 months when he developed Meningococcal meningitis. On recovery it was noted that his response to sound was very poor and a rapid referral to the specialist paediatric audiology clinic followed. Day 28 after admission he was seen in the specialist audiology clinic and a profound loss was diagnosed by behavioural tests of hearing. The recommendation was to arrange home guidance, urgent fitting of hearing aids and contact Cochlear Implant Team. On Day 46 after admission the CT Scan was forwarded to the Cochlear Implant Team. The report indicated incipient ossification and urgent Cochlear implant was advised. However just prior to surgery he developed seizures and there was concern about his general development. It was necessary to consult with a paediatric neurologist regarding how this may affect the surgery and future cochlear implant.

Following the consultation with the paediatric neurologist surgery was undertaken on the left side but was unsuccessful due to the degree of ossification. In view of the degree of ossification it was decided to reoperate on the right side with an alternative approach. Successful implantation of 22 channels on right side using an alternative surgical approach was carried out 20 weeks after admission for meningitis.

### **Case Study 3**

Case 3 was aged 8 years 1 month when she developed Haemophilus influenza meningitis. She complained of hearing problem on night **prior** to admission for meningitis. Audiological assessment was initially carried out on the ward on day 2 when no response to pure tone audiometry at the maximum output of the audiometer was obtained. On day 9 after admission the PTA results were inconsistent varying from 60 to 100 dBHL. Conflicting reports on her responses to sound were received not only from the family but also from professionals involved in her management making it very difficult to obtain accurate audiology even in a specialist paediatric audiology clinic. On day 22 after admission an ABR gave no response to 100 dBnHL both ears but PTA was still inconsistent and suggested a high frequency loss. She was then fitted with hearing aids, a referral was made to the cochlear implant team on day 29 after admission and a CT scan was arranged. The scan reported no signs of osteoneogenesis. Surgery was undertaken for cochlear implantation 16 weeks after admission to hospital for meningitis. At surgery it was found that there was "complete obliteration of the basal and middle turns of the cochlea. No

cochlear lumen was identified. A "J" shaped gutter was drilled along the line of the basal turn and 6 out of 8 electrodes were positioned"

### **Discussion**

**Referral:** Urgent referral to audiology is essential for all children discharged following bacterial meningitis. We recommend that all children should be referred before or at discharge. We also recommend that it is the duty of all audiologists to ensure that their local paediatric departments are aware of the need to refer all babies and children.

**Specialist Paediatric Audiology Clinic:** It is essential that all children, irrelevant of age, are seen in a specialist paediatric audiology centre as it can be seen in these three cases that assessment and diagnosis of profound hearing loss can be complex. It might be expected that the older the child the easier and more accurate the diagnosis would be. However in these cases it was easier to diagnose the profound loss in the child under 1 year of age. Case 1 proved difficult because of conflicting observations in the family and in the clinic. Case 3 proved difficult because of conflicting observations both at home and in school and because of many psychological and emotional problems with the child, parents and wider family. The trauma of sudden acquired hearing loss especially of a profound degree cannot be overemphasised. The effect is perhaps more evident in the older child who has developed linguistic competency but remains immature emotionally. The sudden and profound change in the auditory environment results in conflicting, fluctuating and inconsistent responses and behaviour.

### **Urgent CT Scan or even better MRI:**

We recommend that an urgent CT scan or better MRI is arranged for those found to have a profound loss following meningitis. It is also important that the scans are appraised by the surgeon in the cochlear implant team as well as the radiologist. Experience from these children has shown that CT scan can under estimate the degree of ossification as in two of the cases reported. Indeed in case 3 the C T scan failed to identify the osteoneogenesis. M R I is expected to provide better and more accurate information for Cochlear implant surgeons.

### **Early referral to Cochlear Implant Centre:**

It is essential to give the child with acquired hearing loss following meningitis the benefit of early conventional amplification but in those with profound losses following meningitis it is equally important to make an urgent referral to the cochlear implant team and give parents clear, understandable and honest explanations of what you are doing and planning and why. Both local conventional management and referral to the Cochlear Implant Centre should proceed concurrently. The fitting of hearing aids while awaiting cochlear implantation decision does help in the rehabilitation procedure often confirming to the child and family that conventional hearing aids are not going to provide adequate amplification and thus helping them in reaching a decision about cochlear implantation. In case 1 the parents did want

to continue with the hearing aids before making the final decision but with careful, clear and consistent counselling they came to cochlear implantation well informed and with realistic expectations. In case 3 the emotional problems associated with the fitting of hearing aids resulted in many problems for the child and family concerned and again perhaps affected the decision process. Indeed in this case there are ongoing problems both social and psychological making the audiological management very difficult.

### **Emotional problems of the child and family**

We must be aware of the emotional problems with the child and the family - the changing auditory environment for the child; the parents who have nursed their child through a serious and often life threatening disease; the devastating news that their child who has survived this illness now has a disability which will affect them life long when so recently he/she was normally hearing.

### **Good liaison between all professionals**

Providing consistency is very important for the parents and professional involved to reduce conflicting advice. This requires good liaison between all professionals specifically the local Team including medical and educational staff and the Cochlear Implant Team.

### **Rapid learning curve**

We are looking at a rapid learning curve for the parents and in some cases perhaps also professionals if they have not been involved in cochlear implantation before. In congenital and progressive hearing losses it is common to have a period of 6 to 12 months to assimilate all the information and to make a final decision on cochlear implantation. However in acquired hearing losses following meningitis, if cochlear implantation is being considered, delaying in order to allow adequate time for counselling may ultimately preclude surgery.

### **Information**

The information must be appropriate. It must be given in the most understandable mode and more importantly it must be honest and must not give false hopes or unrealistic expectations.

### **Sharing of concerns and clear explanations**

It is time consuming but essential that all concerns even if answers are not available are shared with the child, parents, extended family and involved professionals. Finally we often find ourselves in a 'catch 22' situation having to balance the time needed to deal with emotional and social issues with the urgency necessary if surgery is to be achieved before the cochlea becomes obliterated.

### **Balancing Act**

<b>Early Diagnosis</b>	<b>Emotional</b>
<b>Accurate Diagnosis</b>	<b>Social</b>
<b>Precise Imaging</b>	<b>Assimilation</b>

***The outcome of referrals to GPs of children who failed the sweep test  
for hearing at school screening.***

***Dr. A. Joshi.***

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## **INTRODUCTION**

It is axiomatic that hearing impairment affects the acquisition of speech and language, academic achievement, and social and emotional development. Therefore early identification and management of hearing impairment is of paramount importance to prevent the above disabilities.

At present, the school screening service is provided by the hospital based Audiology Department. The children who fail the screening are referred to their general practitioner (GP) for further management (see enclosed flow chart - appendix I). The system of notification to parents and GP is maintained by a card system following both the initial test and the subsequent review.

It has been felt that some of the children who fail the test either do not take the card to parents or that the parents do not take their child to the GP. As a consequence, there is a delay in their management as there is no system for immediate follow-up of those who fail to attend the GP. The outcome of their attendance at the GP may not be detected until the next routine review at school by the Community Paediatrician (CP) which can be up to 7 months to 1 year later. It was against this background that the audit was conducted in order to identify the extent of any difficulties in the existing system and to inform future recommendations for follow-up and referral of children who fail the sweep test at school screening.

## **AIM**

To evaluate the outcome of referrals to GPs of children who failed the sweep test for hearing at school screening by -

1. Establishing the extent to which the management of deafness is delayed in children who fail the sweep test and the reasons for that delay.
2. To develop a system for confirmation, notification, and follow-up which addresses any difficulties in the existing system identified throughout the audit.

## **METHOD**

The Study included 8 primary schools over a period of 6 months, from September 1995 to March 1996, based in various localities to cover children from a wide socio-economic background (691 children). Sweep testing was carried out for P.1, P.4, and P.7 classes. The Audiology

Department provided the auditor, a Community Paediatrician (CP), with a list of those children who failed the sweep test along with the children's audiograms. A letter was sent to the GP of these children 3 weeks after the test date to establish the outcome of the referral. Where the GP indicated that a child had not attended, a letter was sent to the child's parents in order to establish the reason for non attendance. For 9 children, a second letter was sent to parents who had not responded. An opportunistic visit from the School Nurse was arranged for 5 children whose parents had not replied to the second letter.

The responses from GPs and parents were collated and analysed.

## **FINDINGS**

### **1. Screening**

Total No. of children to be screened	691
No. of children absent	32 (5%)
No. of children left area or moved to different school	7

No. of children screened	652 (94%)
No. of children failed	29 (4.5%)
Would Not Co-operate	6 (1%)

### **2. Parental Action**

#### **Of the 29 Who Failed the Sweep Test**

Attended GP	15(52%)
Did Not Attend (DNA)	14(48%)

Of the DNA Group - 14 (48%)

Received Notification Card	8 (57%)
Did not receive Card	6 (43%)

Of Parents who received the Card - 23 / 29 (79%)

Total No. of parents who took action	15/23(65%)
Parents who did not take action	8/23(35%)

**Of the 14 whose management was delayed** as a consequence, the above findings show that the management of 6 children was delayed due to non-receipt of the notification card and in a further 8 due to lack of action by the parent. One of the 8 parents had a valid reason for non-attendance / lack of action.

**3. Outcome of Attendance at GP**

No. of children who attended GP	15 / 29 (52%)
No. kept under GPs observation	8 (53%)
No. referred to ENT	7 (47%)

**4. Extent of Hearing Loss (Appendix 2)**

Children who were kept under Observation of GPs - 8 (53%)

Hearing Loss	Children	Percentage
Mild Unilateral	1	12.5
Mild Bilateral	1	12.5
Moderate Bilateral	4	50
Moderate Unilateral	2	25

Children who DNA to GP - 14(48%)

Hearing Loss	Children	Percentage
Moderate Unilateral	9	64.28
Mild Bilateral	1	7.4
Moderate Bilateral	4	28.57

**5. DNA Ratio of Children attending the Audited School**

St. Ninian's	5:7
Lochside	2:3
Kelloholm	2:3
Troqueer	1:2
Castledykes	1:2
St. Michael's	2:7
Lincluden	1:4

It is evident from the above table that the DNA ratio is higher for the schools located in what may be termed a 'disadvantaged area'.

**6. Reasons given by parents who received the card but did not attend GP**

- DNA as was attending ENT (one child)
- DNA GP as child's hearing has been said to be normal when attended ENT in the past (one child)
- 2 parents decided to take their children to GP after receiving reminder (3 - 4 months after test date)
- Two parents did not give reason but stated that the child has passed the hearing test at re-checks session (3 months after test)
- one parent stated they had lost the card but intended to take child to GP after receiving our reminder (3 months since tested)
- One mother felt that she was not concerned about child's hearing and had other priorities than to take child to GP

*Cont on page 28*

## **DISCUSSION**

The study revealed that 29 children (4.5%) failed the sweep test. 15 children attended their GP and 14 children did not. It was encouraging to note that 23 of the 29 children had given the notification card to their parents. However, conversely, 6 had not. This poses the question as to whether it is acceptable for the management of 6 out of 29 children to be delayed due to non receipt of the notification card. While the number may seem small, there is the potential for this to be reflected across the region. Could the situation be improved by making some changes in the notification system as anecdotally it is known that some parents are concerned about not receiving the notification card and therefore not being aware of the child's hearing difficulty.

The parents of 8 children did not take the child to their GP in spite of receiving the notification card. Only one parent out of the 8 had a valid reason for non-attendance at the GP. It would appear that the introduction of a follow-up system 6 - 8 weeks after the first screening (the practice in all other areas) would be helpful in preventing long delays in the management of those who did not initially attend their GP.

At school medical review, a reason for non-attendance often given by parents, and cited by one parent in the audit, is the frustration of receiving multiple notifications requesting attendance at the GP. This happens when children have fluctuating hearing loss (? non-organic hearing loss CNOHL), for some years. These children may have been referred on to the ENT Consultant at some point and have been shown to have satisfactory hearing - hence the frustration for parents. However, it is important that such children, often from families with social problems, receive long term support afforded by a follow-up service. It was noted that 6 our of the 14 children who did not attend their GP exhibited fluctuating hearing loss (? NOHL). Several studies suggest that NOHL is a manifestation of, or reaction to, stress and merits detailed investigation, treatment and follow up (Brooks & Geo. Hegan. 1992). This ought to be acknowledged and CP involvement in a follow-up system may best ensure co-ordination and involvement of other agencies as appropriate.

15 children attended the GP, 7 of whom were referred to ENT but 8 children were kept under observation by their GPs. One of the children had attended the GP initially but did not attend for further follow-up in spite of showing evidence of otitis media with effusion (OME). It is a matter of concern that 4 children out of 8 who were kept under observation, had bilateral moderate hearing loss. In the

present notification system, GPs do not receive a copy of hearing test results (audiogram) as an indicator of the degree of hearing loss. GPs may have taken a different course of action had they received information about the extent of the child's hearing loss. The routine provision of such information along with notification may promote earlier intervention and management.

The audit also highlighted some other shortcomings of the present system, i.e. the absence of 32 children on the screening date and the fact that 6 children did not co-operate for the test. These 38 children would not be tested until the following year. Those among them with hearing impairment would, therefore, not be detected until the next year, which has implications for the education, social and emotional development of the child. A follow-up system, which addressed this issue, would eliminate the problem.

At present, the audiograms of those who fail the sweep test are sent to Community Paediatricians by the Audiology Department. The CP follows up these children in school at their review medical session to establish the outcome / progress regarding the management and informs school staff about the child's hearing difficulty, having received the consent of the parent present at this review. It is essential that the school staff are aware of the child's difficulties. It was noted that there can be a delay of 3 weeks to 3 months between the child's test and receipt of the audiogram by the CP. On occasions, the audiograms were received by the CP after the review medical session had been completed for the child's school. There is at present no easy way to establish the progress / outcome for these children before the next annual medical. This situation presents a dilemma for the CP who may be seen to be breaching confidentiality by informing the school without parental consent, in cases where he / she deems it essential to do so in the interest of the child's welfare.

## **CONCLUSION**

The audit has established that there are delays in the management of deafness for a proportion of children who fail the sweep test at school screening. The delays are due to non-receipt of notification by the parents, lack of action by the parents and potentially, in some case, a decision by the GP to keep a child under observation. The delays are in turn due to the present notification system, the lack of a follow-up service and the fact that GPs do not receive information about the extent of a child's hearing loss.

Although the number is small, there is the potential for many more children to be affected if these findings were to be reflected in a study of all the schools in the region.

Some parents were prompted to take their child to the GP on receipt of the audit questionnaire, emphasising the value of a follow-up system. The difficulty surrounding fluctuating hearing loss and parental understanding were highlighted.

The study also revealed that the DNA ratio was higher for the schools located in what may be termed a 'disadvantaged area'.

## RECOMMENDATIONS

From the audit, it is evident that in order to meet the objective of early identification and management of children with hearing impairment, the following is required:-

### 1. An improved system of routine follow-up for children

who -

- a. failed the sweep test
- b. DNA their GP
- c. Were absent on the day of the test
- d. Did not co-operate for testing
- e. Require monitoring of mild hearing loss
- f. Require early confirmation and referral resulting in intervention for children with moderate - severe hearing loss

An introduction of routine follow-up, 6 - 8 weeks after the initial test would be able to fulfil the above requirements.

2. Modification to the notification system to parents is essential. This could be achieved by posting a letter to parents directly, informing them about their child failing the screening and at the same time offering an appointment for follow-up.

3. Provide GPs with more detailed information about a child's hearing test results, i.e. audiogram and extent of hearing loss in order to allow them to make an informed decision about review or onward referral and therefore prompt and appropriate action to ensure early management.

4. A co-ordinated service with Community Paediatricians, Audiometrists, GPs and ENT Consultants is required.

5. Long term support or follow-up for children with fluctuating hearing loss or NOHL is necessary through involvement of CPs in follow-up system to ensure co-ordination and involvement of other appropriate professionals.

6. Joint working of CPs with Audiometrists appears to be the best way forward to meet the above requirements. This could be provided by locality based hearing assessment clinics. Therefore, children will be followed up in their own locality. CPs will also be able to encourage parents to notify school staff about their child's difficulty where their hearing impairment may have implications for their education. Updated information about the management would also be obtained by parents.

## POTENTIAL BENEFIT

A well co-ordinated, locality based follow-up service with Community Paediatricians, Audiometrists, GPs and ENT Consultants will be provided to fulfil the objective of early identification and management of hearing impairment to improve a child's language, development, academic achievement, and social and emotional development.

## ACTION

Initiate a consultation process with all interested parties in order to agree the way forward for the service.

## REFERENCES

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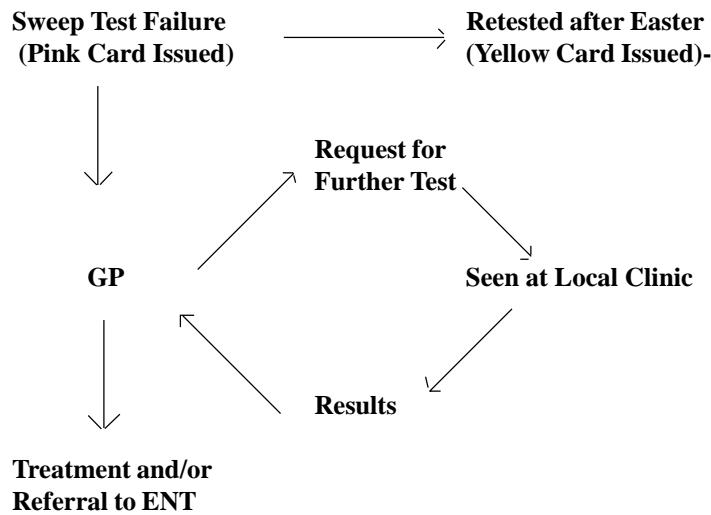
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## APPENDIX I

Dear Doctor

### **School Hearing Screening Programme**

In order to complete the first visits to all Primary Schools within the region by Easter, we will not be commencing "RETESTS" until after Easter. Therefore could you please act on the first (i.e. pink) card presented to you by the parents. If you wish the child to have a further test please refer to the Audiology Department. The Child will be seen at the nearest clinic and results sent to you. Otherwise they will be retested at school after Easter.



The school screening is carried out by staff from the Audiology Department and the results are as accurate a measure as possible of the children's hearing given the background level of sound found in schools.

If you have any questions concerning the above please do not hesitate to contact me.

Yours sincerely,

Alison Hogg  
Chief Audiology Technician

## APPENDIX II

### **AUDIOMETRIC DESCRIPTION**

	<b>dBHL</b>
Mild Hearing Loss	20 -40
Moderate Hearing Loss	41-70
Severe Hearing Loss	71 - 95
Profound Hearing Loss	in excess of 95

## HUMAN AIDS TO COMMUNICATION

The United Kingdom Council of the Deaf (UKCOD) has drawn up definitions of Human Aids to Communication (HACS). This was prompted by the Disability Discrimination Act (DDA) as the deaf have rights under this new legislation. BACDA members should be aware of these groups of people who provide help for deaf people to communicate in different situations.

### **What does a HAC do?**

There are currently five recognised professional skills for HACs.

**Lipspeakers** are used in communication with hard of hearing and profoundly deaf people who are able to lip-read English. The lipspeaker provides clear lip patterns to match the words of the speaker.

**Speech to text reporters** provide a simultaneous transcription of speech which can then be read on a monitor or large screen. This system is increasingly in demand among a wide range of deaf people.

**Sign Language interpreters** interpret between English and Sign Language for profoundly deaf people whose first or preferred language is Sign Language. This group is commonly referred to as Deaf, distinguishing both the cultural and linguistic differences of this community.

**Communicator/guide-helps** for deafblind people act as the eyes and ears of the deafblind person enabling two way communication with other people, access to information and a means of travelling and moving about in different locations.

**Notetakers** work with individual deaf people and write down most of what is said during meetings or at lectures, etc. They work within the specific requirements of the deaf person.

### **When is a HAC required?**

Hard of hearing and deafened people benefit from the services of a HAC where there are a number of people present and where there may be some distance between themselves and the speaker. Thus they are likely to depend primarily on the

deaf awareness of hearing people in one-to-one situations such as a consultation with a doctor, whereas they may require a HAC for a job interview at which they are meeting a panel of people, and they would certainly benefit from a HAC at a public meeting.

Increasingly, young deaf people are requiring English based communication support as a result of their integration into mainstream education.

Deaf people whose first or preferred language is sign language require an interpreter in any situation where communication matters. **British Sign Language** is the fourth indigenous language in the UK and it is important to remember that a large proportion of this group are not fluent in English and do not therefore lipread.

[Some Deaf people prefer to ask a hearing friend or relative to interpret for them because they are more comfortable with an informal and supportive relationship. However, there are real risks to the use of unqualified interpreters in sensitive situations and a new professional standard is currently being developed that combines sign language skills with those of personal support.]

Some deafblind people require communicator/guides for all spoken communication; some may prefer (Braille transcription) at meetings.

The addresses of some of these groups are listed below.

**Association of Lipspeakers**  
4 New Wokingham Rd  
Crowthorne Rd  
Berkshire RG117NR  
Tel. 01344 772303

**Association of Sign Language Interpreters**  
C/o Bryn Melyn  
Lon Pant-y-Gog  
Nebo  
Caernavon  
Gwynedd  
Wales LL54 6DU

Tel. 01286 880808 (Voice/Minicom)

**Sense - National Deafblind and Rubella Association**  
11-13 Clifton Terrace  
London N4 3SR  
Tel 0171 272 7774  
Fax 0171 272 6012